

WHAT IS THE BEST CUT-OFF VALUE FOR THE LEVATOR- URETHRA GAP MEASUREMENT IN THE DIAGNOSIS OF AVULSION DEFECTS?

Hypothesis / aims of study

Levator avulsion is a risk factor for pelvic floor organ prolapse and for prolapse recurrence after surgical repair. Avulsion diagnosis on transperineal ultrasound can be performed using tomographic ultrasound imaging (TUI) on volumes acquired on pelvic floor muscle contraction (PFMC) (1). The levator-urethra gap (LUG) is the distance between the urethral lumen centre and levator insertion on the inferior pubic rami. It has been previously suggested that a $LUG \geq 2.5$ mm is another valid method to diagnose avulsion defects (2). However there appear to be ethnic variations (3) which question the validity of this cut-off for widespread use. Our aim was to determine a cut-off for LUG measurements in our patient population.

Study design, materials and methods

Women followed prospectively in our tertiary referral centre after sustaining labour trauma (OASIS) underwent an interview, standardized pelvic floor questionnaires and 2D/3D/4D transperineal ultrasound examination (GE Kretz Voluson 730, E6 or E8). Levator avulsion was diagnosed on PFMC using tomographic ultrasound imaging (TUI) and abnormal insertion was determined in the three central slices. Ultrasound datasets were analyzed offline (4DView) at a later time blinded to the clinical data and previous ultrasound measurements. LUG was measured on each side of the three central slices, yielding 6 measurements and an average for each side was obtained. Statistical analysis was performed using SPSS and a two-sided P-value of < 0.05 was considered statistically significant. Both methods were correlated and agreement between methods was determined. Different cut-off were evaluated using ROC curve analysis.

Results

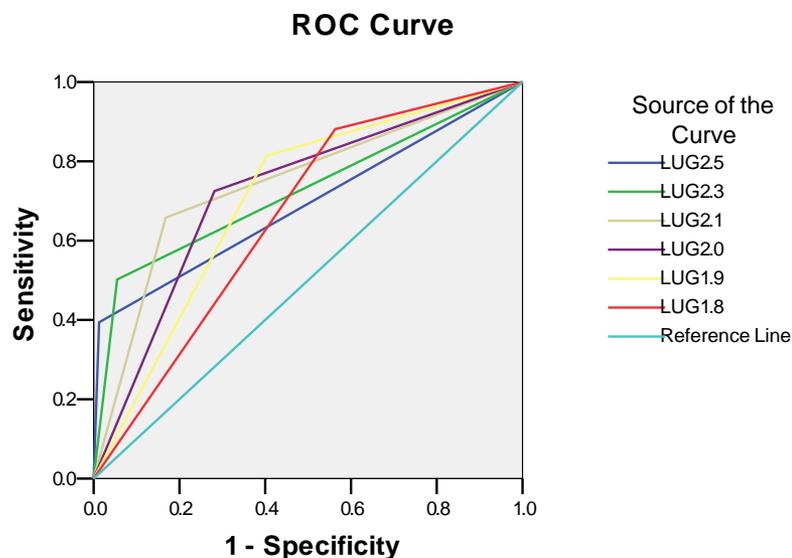
507 complete datasets were available for analysis. The mean age was 28.9 ± 4.9 years, the mean BMI 23.9 ± 4.1 kg/m², median parity 1, 73.4% were primiparous, instrumental deliveries – 25.6% of which forceps - 4.2%. None of them had previously undergone pelvic floor surgery. Mean LUG distances were: right LUG 2.15 ± 0.56 mm, left LUG 2.12 ± 0.53 mm. Data was analysed for groups based on the presence of avulsion. The relevant demographic data and levator measurements are described in Table 1.

Table 1: Demographic data and levator measurements in women with and without avulsion defects.

Parameter	No avulsion	Avulsion	P value
Demographics			
Age (years)	28 ± 4.7	29.6 ± 4.9	< 0.001
BMI (kg/m ²)	24.3 ± 4.4	23.5 ± 3.9	0.034
Forceps delivery (percentage)	2.1	5.9	0.042
Levator findings on ultrasound			
Levator rest area (cm ²)	16.1 ± 3.8	17.7 ± 5.5	< 0.001
Levator valsalva area (cm ²)	22.3 ± 7	25.3 ± 8.1	< 0.001
Levator contraction area (cm ²)	12.2 ± 2.8	15.7 ± 5.3	< 0.001
LUG right (mm)	1.83 ± 0.28	2.42 ± 0.61	< 0.001
LUG left (mm)	1.84 ± 0.26	2.37 ± 0.59	< 0.001

LUG measurements were higher with increasing age ($P < 0.001$) and height ($P < 0.05$). A cut-off of $LUG \geq 2.5$ missed 60.6% of avulsions, $LUG \geq 2.3$ missed 49.8%, $LUG \geq 2.1$ missed 34.2%, $LUG \geq 2$ missed 27.5%, $LUG \geq 1.9$ missed 18.6%, and $LUG \geq 1.8$ missed 11.9% of avulsions. An ROC Curve analysis including all possibilities outlined gave the best area under the curve for a cut-off of $LUG = 2.1$ (Area 0.745, 95%CI 0.701-0.789, $P < 0.001$). See Figure 1.

Figure 1: ROC curve analysis for the LUG cut-off



Diagonal segments are produced by ties.

Interpretation of results

The measurement of LUG is indeed helpful in evaluating and in standardizing imaging diagnosis of avulsion defects. However, there seems to be a significant ethnic variation, and it appears that the suggested cut-off of 2.5 mm is not always appropriate. It is reasonable to know the cut-off in a specific population, which in our study was 2.1 mm.

Concluding message

LUG distance measurement is useful but should be tapered based on the population studied.

References

1. Int Urogynecol J 2011; 22:699–704
2. Int Urogynecol J 2016; 27:909–913
3. Am J Obstet Gynecol 2011; 205:232, e1-8

Disclosures

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